**BUFFER ISSUE RESOLUTION DOCUMENT (BIRD)**

**BIRD NUMBER:** 203

**ISSUE TITLE:** Submodel Clarification

**REQUESTOR:**  Randy Wolff, Micron Technology

**DATE SUBMITTED:** March 10, 2020

**DATE REVISED:**

**DATE ACCEPTED:** April 24, 2020

**DEFINITION OF THE ISSUE:**

This BIRD addresses IBISCHK parser concerns documented in BUG207. Text is added to the [Add Submodel] keyword definition section to clarify the relationship between data in the top-level model and data in a submodel in simulation.

**SOLUTION REQUIREMENTS:**

The IBIS specification must meet these requirements:

Table : Solution Requirements

|  |  |
| --- | --- |
| Requirement | Notes |
| 1. Clarify the relationship between Model and Submodel in simulation |  |

(Enumerate each requirement in the table above, adding rows as needed.)

**SUMMARY OF PROPOSED CHANGES:**

For review purposes, the proposed changes are summarized as follows:

Table : IBIS Keywords, Subparameters, AMI Reserved\_Parameters, and AMI functions Affected

|  |  |  |
| --- | --- | --- |
| Specification Item | New/Modified/Other | Notes |
| [Add Submodel] | Modified | Text added to keyword definition section |

**PROPOSED CHANGES:**

Replace the following text in the IBIS specification:

*Keyword:* [Add Submodel]

*Required:* No

*Description:* References a submodel to be added to an existing model.

*Usage Rules:* The [Add Submodel] keyword is invoked within [Model] to add the functionality that is contained in the submodel or list of submodels in each line that follows. The first column contains the submodel name argument for a [Submodel] keyword defined in the same .ibs file. The second column contains a submodel mode under which the submodel is used.

If the top-level model type is one of the I/O or 3-state models, the submodel mode may be Driving, Non-Driving, or All. For example, if the submodel mode is Non-Driving, then the submodel is used only in the high-Z state of a 3-state model. Set the submodel mode to All if the submodel is to be used for all modes of operation.

The submodel mode cannot conflict with the top-level model type. For example, if the top-level model type is an Open or Output type, the submodel mode cannot be set to Non-Driving. Similarly, if the top-level model type is Input, the submodel mode cannot be set to Driving.

The submodel mode can be set to All to cover all permitted modes for any top-level model type including, for example, Input, Output, and I/O.

The [Add Submodel] keyword is not defined for Series or Series\_switch model types.

Refer to the Add Submodel description in Section 6.2 of this document for the descriptions of available submodels.

*Example:*

[Add Submodel]

| Submodel\_name Mode

Bus\_Hold\_1 Non-Driving | Adds the electrical characteristics of

| [Submodel] Bus\_Hold\_1 for receiver or

| high-Z mode only.

Dynamic\_clamp\_1 All | Adds the Dynamic\_clamp\_1 model for

| all modes of operation.

With the following new text (changes highlighted in red):

*Keyword:* [Add Submodel]

*Required:* No

*Description:* References a submodel to be added to an existing model.

*Usage Rules:* The [Add Submodel] keyword is invoked within the [Model] keyword section to add the functionality that is contained in the submodel or list of submodels in each line that follows. Top-level model I-V and V-T data extraction is self-consistent and done with all submodels removed or de-embedded. Submodel behaviors are added in simulation according to the submodel mode described below.

The first column of the [Add Submodel] keyword contains the submodel name argument for a [Submodel] keyword defined in the same .ibs file. The second column contains a submodel mode under which the submodel is used.

If the top-level model type is one of the I/O or 3-state models, the submodel mode may be Driving, Non-Driving, or All. For example, if the submodel mode is Non-Driving, then the submodel is used only in the high-Z state of a 3-state model. Set the submodel mode to All if the submodel is to be used for all modes of operation.

The submodel mode cannot conflict with the top-level model type. For example, if the top-level model type is an Open or Output type, the submodel mode cannot be set to Non-Driving. Similarly, if the top-level model type is Input, the submodel mode cannot be set to Driving.

The submodel mode can be set to All to cover all permitted modes for any top-level model type including, for example, Input, Output, and I/O.

The [Add Submodel] keyword is not defined for Series or Series\_switch model types.

Refer to the Add Submodel description in Section 6.2 of this document for the descriptions of available submodels.

*Example:*

[Add Submodel]

| Submodel\_name Mode

Bus\_Hold\_1 Non-Driving | Adds the electrical characteristics of

| [Submodel] Bus\_Hold\_1 for receiver or

| high-Z mode only.

Dynamic\_clamp\_1 All | Adds the Dynamic\_clamp\_1 model for

| all modes of operation.

**BACKGROUND INFORMATION/HISTORY:**

Discussion on BUG207 is documented in the bug report and IBIS Quality task group meeting minutes and Open Forum meeting minutes.